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27 April 2016

Ashland Fire Prevention
70 Cedar Street
Ashland, MA 01721

Attn: Captain Keith Robie

Re: Draft Blast Plan
Ashland Rail Transit District
Ashland, MA

Dear Captain Robie:

New England Research, Inc. (NER) and the Blastech Corporation are working jointly on the above project. Our involvement with the above project mandates the submittal of this draft blast plan pursuant to the Single Environmental Impact Report (EIR) approval letter issued to Campanelli Acquisitions LLC (Owner) on 15 April 2016. It is our understanding the Owner wishes to develop sections of this lot by reducing the existing grade which will involve blasting. Current measurements show blasting will be conducted as close as 874 ±5 feet east of the wood road that circles the Nyanza Superfund Site. Measurements are taken from inside edge of roadway to the closest proposed borehole (See Exhibit-2). A summary of the requirements set forth in the EIR appear below:

1. Draft Blast Plan for approval by Ashland Fire Chief – submitted to MassDEP, EPA and Ashland Board of Selectmen for comment.

2. Incorporate comments into Final Blast Plan for approval by Ashland Fire Chief.

3. Pre-blast surveys of the abutters.

4. Seismograph installations.

5. Baseline monitoring program.

6. Ashland Fire Department and MassDEP to be present during all blasting.

7. Test blast(s) and reporting procedures.

The following procedures express the methods that will be employed to satisfy the EIR requirements and address the above concerns. The technical section that follows illustrates the actual blast design that will allow us to achieve a safe and productive outcome on this project.

Blasting Procedures

Prior to the start of any blasting project Blastech performs a site visit to obtain firsthand knowledge of any potential constraints or concerns presented by the Town, physical site, client or abutters. The most prominent concern NER and Blastech have found with this site is the close proximity of the existing Nyanza site and the cap enclosing the contaminants. The primary concern is being able to regulate resulting ground vibrations due to blasting so as not to alter the integrity of the cap covering the Nyanza site. These concerns are in addition to the compliance limits for ground vibration and air blast set forth in 527 CMR 1 and NFPA 495.

Safety

It is the policy of Blastech to ensure that all employees are aware of and properly trained in the recognition, control, transport and use of Explosives and to observe all State and Federal Laws and Regulations. All employees on this project will have the appropriate licensing and Certifications required by the State of Massachusetts. Prior to the transport of any hazardous material for any project or transfer the Blaster in Charge involved with the project will according to the Blastech Safety Plan and perform a Job Safety Analysis (JSA). The JSA will be conducted daily and whenever site conditions change.

Prior to any blasting taking place a pre-blast survey will be offered to the abutters closest to the blasting. This includes residences on Russett Hill Rd., Wilbur Drive, Baldwin Circle and High Street (See Exhibit-1).

Blast Warning Signal signs will be placed according to the requirements of MGL 527 CMR 1 and additional signs will be posted at all potential entries to the site. Prior to the initiation of any blasts it is the Blaster in Charge (BIC) that will be responsible for ensuring the designated blast site and blast area are cleared of all non-essential personnel. The BIC will be responsible for notifying Ashland Fire Prevention and MassDEP personnel of impending blast times. Once this has been established the Blast Warning Signal sequence may begin. We currently use electric rechargeable sirens with an audibility of greater than 1,000 feet. The Blast Warning Signal sequence is as follows: Warning Signal, three long blasts/whistles/sirens five (5) minutes prior to the shot, Blast Signal, two long blasts/whistles/sirens one (1) minute prior to the shot and the All Clear Signal, one long blasts/whistles/sirens after the blast area has been inspected by the blaster in charge.

All blasts will be monitored with seismographs set up in accordance with the I.S.E.E. Field Practice Guideline for Blasting Seismographs. The seismographs will be set up prior to each blast in an array toward the Nyanza Landfill and at the closest residential structure(s) to the blast (See Exhibit-2). All seismic readings will be provided to the Ashland Fire representative and MassDEP representative on site. The information to be included on the seismic results can be seen in the example attachment Seis -1.

Misfire procedure will follow the 527 CMR 1 and NFPA 495 10.5 as follows:

"10.5 Misfires.

10.5.1 Where a misfire is found, the blaster-in-charge shall provide the proper safeguards for excluding all personnel from the blast area.

10.5.2 Misfires shall be reported to the supervisor immediately.

10.5.3 No additional work, other than that necessary to remove the hazard, shall be performed.

10.5.3.1 Only those persons needed to do such work shall remain at the blast site.

10.5.4 No attempt shall be made to extract explosive materials from a misfired hole.

10.5.4.1 A new primer shall be inserted, and the hole reblasted.

10.5.4.2 Where reblasting presents a hazard, the explosive materials shall be permitted to be washed out with water, or, where the misfire is under water, blown out with air.

10.5.5 Whenever there is a misfire, all personnel shall remain at a safe distance for at least 15 minutes (30 minutes if electronic or cap and fuse initiation is used).

10.5.6 Misfires shall be the responsibility of the person in charge of the blasting operation.

10.5.7 Where a misfire is suspected, all initiating circuits (electric or nonelectric) shall be traced carefully and a search made for unexploded charges.

10.5.8 No drilling, digging, or picking shall be permitted until all misfires have been detonated or until the authority having jurisdiction approves the resumption of work."

In order to maximize safety and minimize the potential for excessive air blast or fly rock all blasts will be matted.

Baseline Monitoring

Before any blasting takes place on the Ashland Rail Transit District site a baseline monitoring program will be implemented to record the existing everyday variations in ground vibrations. The

particulars and results of this program will be under separate cover and all results forwarded to Ashland Fire Department, Ashland Board of selectmen, MassDEP and the EPA.

Test Blasting

It is our intention to begin blasting operations in the area proposed as Building 3. This area has been selected as it provides a location to perform a test blast in an area providing us shallow rock cuts and the opportunity to direct vibrations away from the Nyanza Landfill. The proposed test blast location is 874 ± 3.0 feet from the edge of cap. The purpose of the test blast(s) is to determine rock response, peak particle velocities and fragmentation results based on our proposed blast patterns, hole diameters and product selection. Additionally, the test blast(s) will be designed to initiate the development of a directional free face to provide relief for subsequent production blasting.

Vibration data recorded during the test blast program will provide us the opportunity to begin graphing a scale distance plot which will help us determine and confirm how selected explosives weights are performing with relation to the rock's response. By adding all subsequent blast vibration data to the scale distance plot we will be better able to match explosive's weights with predicted peak particle velocity results. Following the successful completion of the test blast program begin production blasting will begin immediately behind (west) of the test blast area.

Test and Production Blasting Technical Data

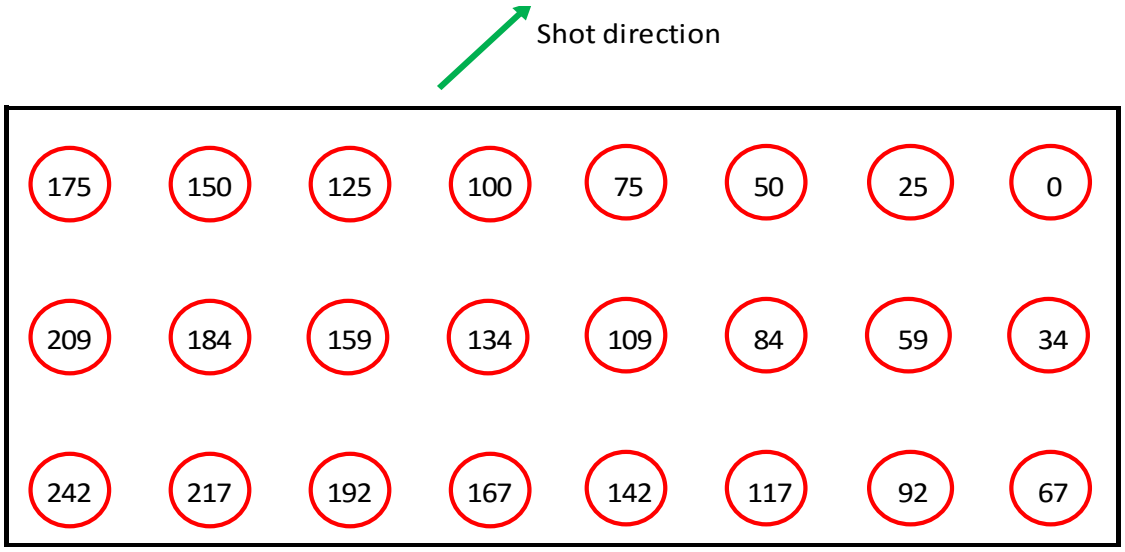
As stated above, the first test blast is proposed to be in the area of Building 3. This test blast is designed for a 7.0 – 10.0 foot cut using a hole depth of 13.0 feet. Spacing of the holes will be 6.0 feet and the burden will be 6.0 feet. Initial borehole diameter is to be 3.0 inches.

The explosives will be initiated using a non-electric system and we will be initiating one hole per delay. The plan view diagrams below show the burden and spacing pattern with the timing sequence, the encircled numbers in the plan views are in milliseconds. The profile views show the types and placement of explosives in a typically loaded hole. The explosive product types being proposed follows the profile views.

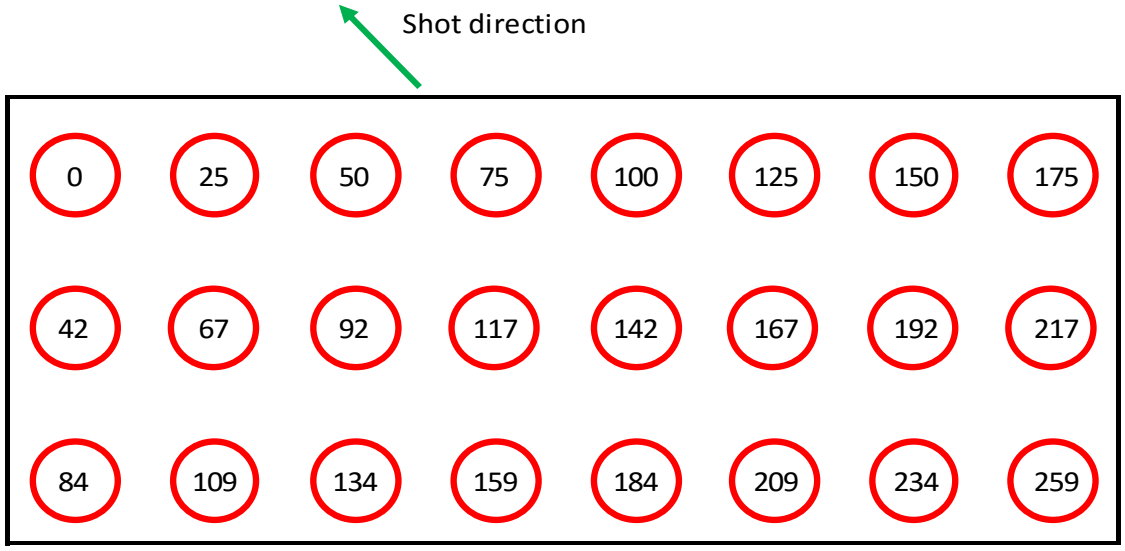
We are providing 8 profile scenarios for the expected site conditions, four for dry holes and four for wet holes. This is necessary as the type of explosive product will vary according to local geologic and site conditions. Please note that the positioning of the millisecond delay initiators allows the blaster to control the movement and direction with a great degree of accuracy.

Table 2 below the diagrams shows the expected peak particle velocities for the average bounds of experience where K = 160 which is the value adopted in the formula accepted by the State of Massachusetts for predicting peak particle velocity.

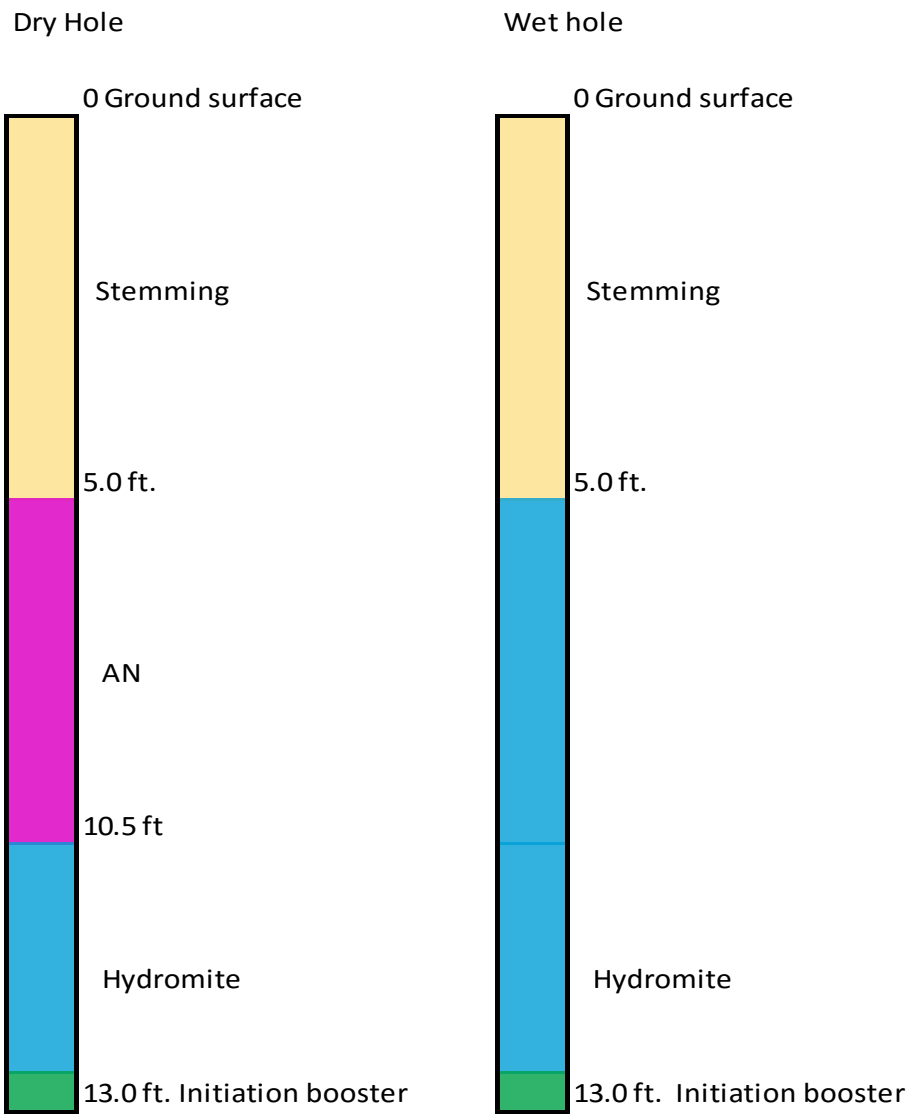
Test Blast and Production Blast Timing Sequence 6.0′ x 6.0′ x 13.0′ & 6.0′ x 6.0′ x 18.0′



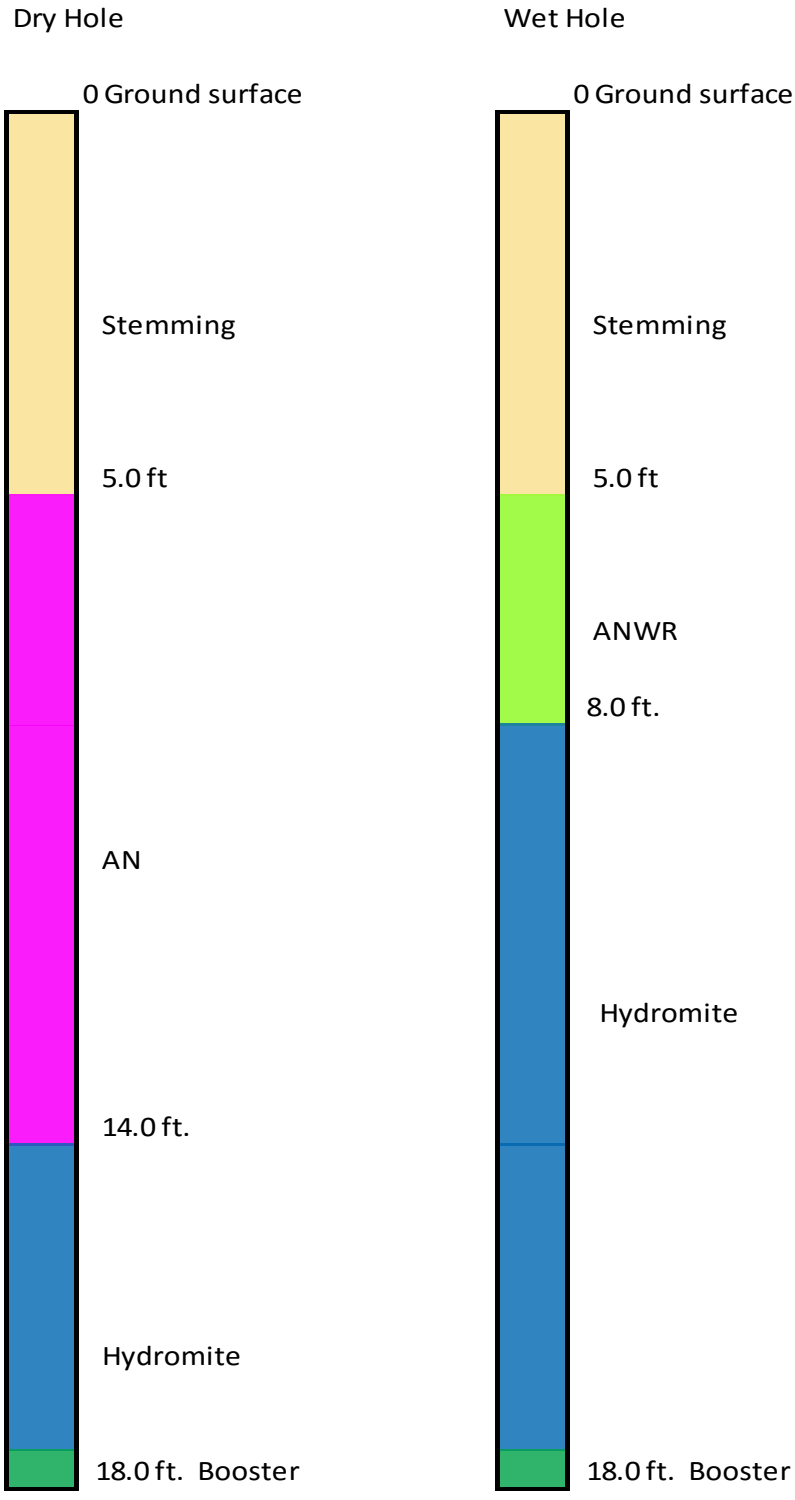
Production Blast Timing Sequence 6.0′ x 6.0′ x 23.0′ & 6.0′ x 6.0′ x 28.0′



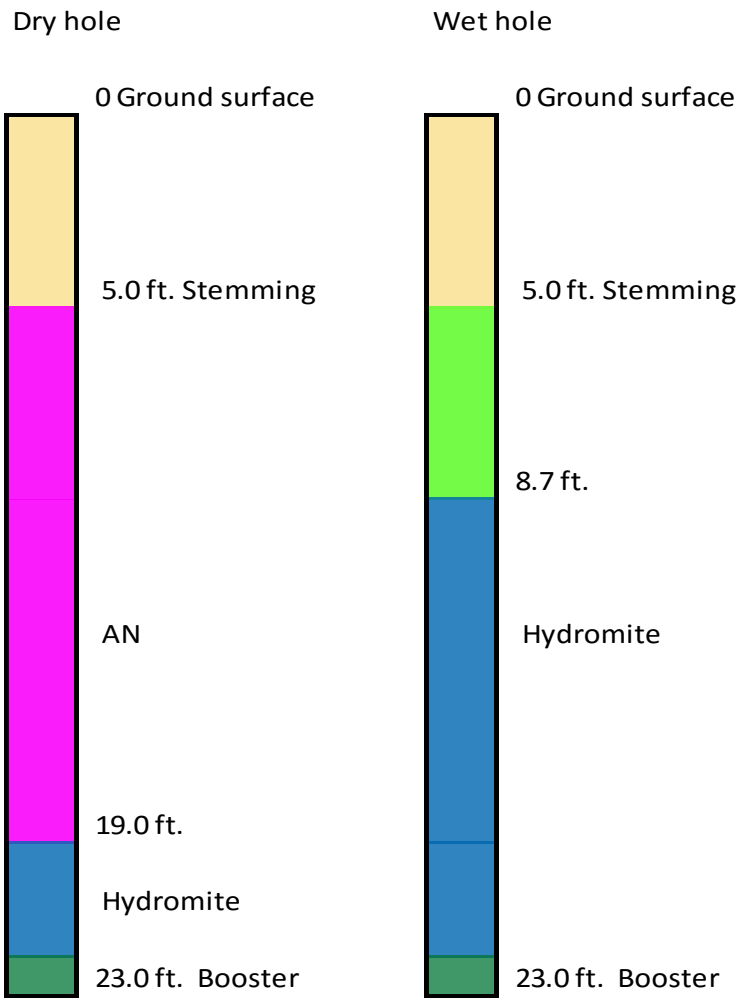
Borehole depth 13.0 ft. (NOT TO SCALE)



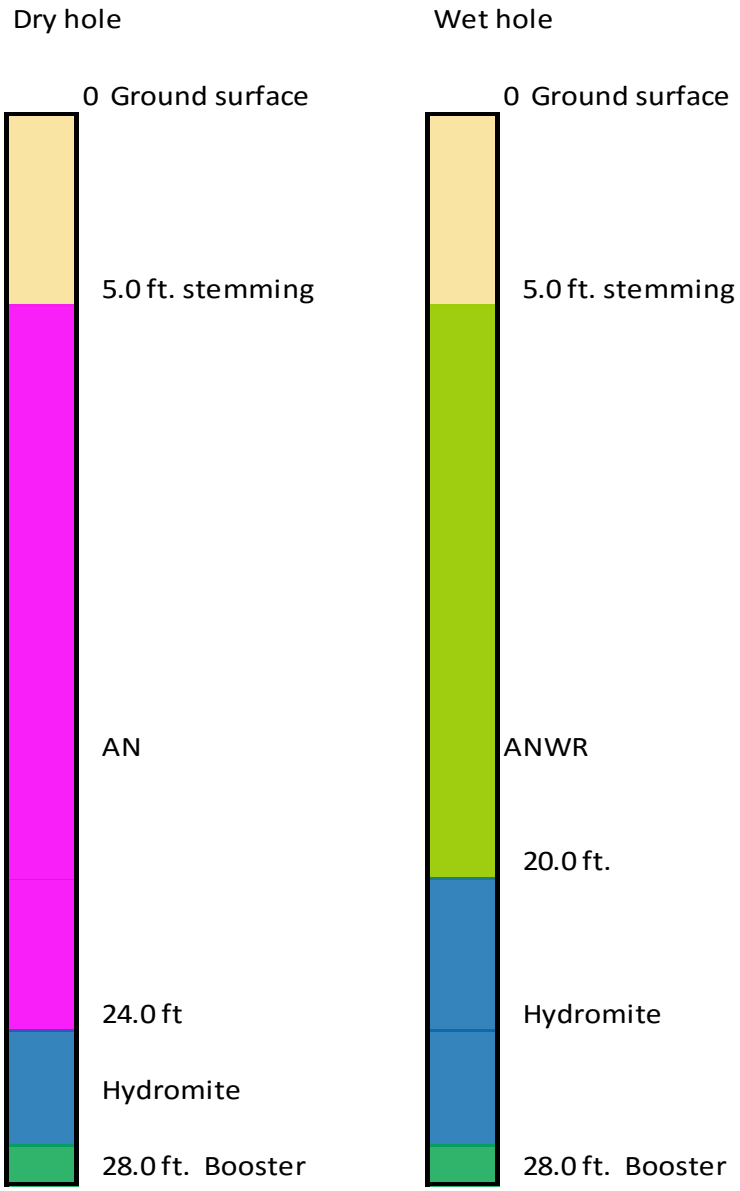
Borehole depth 18.0 ft. (NOT TO SCALE)



Borehole depth 23.0 ft. (NOT TO SCALE)



Borehole depth 28.0 ft. (NOT TO SCALE)



In all of the above column load diagrams the products used are as follows:

Stemming – 3/8 inch crushed stone.

Explosives Columns:

5.3 oz cast booster – Used to detonate the explosive column

Hydromite 880 2.5 inch by 16.0 inch emulsion with an S.G. of 1.26 g/cc, average weight per stick 3.33 pounds. This is a booster sensitve product with a VOD of 15,800 ft/s.

Ammonium nitrate prills with an S.G. of 0.82 g/cc with a VOD of 13,000 ft/s.

Water resistant AN prills with an S.G. of 0.90 g/cc with a VOD of 14,300 ft/s.

Table 1 below lists the individual borehole explosive's weights.

TABLE 1

Borehole Depth	Dry Weight (pounds)	Wet weight (pounds)
13	20.81	20.31
18	32.93	32.83
23	45.49	48.82
28	58.06	61.68

In **Table 2** below we have calculated the predicted peak particle velocities (PPV) using the following formula PPV= $k(SD)^{-1.6}$. In this formula, k represents a value of rock response and confinement. These values are based on studies by the United States Bureau of Mines (USBM) and adopted by all States for predicting vibration values. We are using k=160 as a starting point and the most common value accepted. The SD in the equation refers to Scale Distance which is a square root relationship of the maximum weight (W) of explosive initiated during an 8 millisecond period and the actual distance (d) in feet from the closest borehole to the point of concern. Scale distance is found by the following formula SD = $\frac{d}{\sqrt{W}}$.

Table 3 shows the anticipated elastic displacement values based on the maximum pound per delay and predicted PPV's. We are using the maximum pounds listed in Table 1 and a cut off frequency of 40 Hz.

TABLE 2

PREDICTED PEAK PARTICLE VELOCITY (INCHES PER SECOND)				
Distance (ft.)	**PPV for 13.0 ft. hole**	**PPV for 18.0 ft. hole**	**PPV for 23.0 ft. hole**	**PPV for 28.0 ft. hole**
250	0.26	0.38	0.52	0.63
300	0.19	0.28	0.39	0.47
350	0.15	0.22	0.31	0.37
400	0.12	0.18	0.25	0.30
450	0.10	0.15	0.20	0.25
500	0.09	0.13	0.17	0.21
550	0.07	0.11	0.15	0.18
600	0.06	0.09	0.13	0.16
650	0.06	0.08	0.11	0.14
700	0.05	0.07	0.10	0.12
750	0.04	0.07	0.09	0.11
800	0.04	0.06	0.08	0.10
850	0.04	0.05	0.07	0.09
900	0.03	0.05	0.07	0.08
950	0.03	0.04	0.06	0.07
1000	0.03	0.04	0.06	0.07
1050	0.03	0.04	0.05	0.06
1100	0.02	0.04	0.05	0.06
1150	0.02	0.03	0.05	0.05
1200	0.02	0.03	0.04	0.05

Approximate closest distance to the Nyanza Superfund site

Table 3

Distance ft.	Max. Wt. lbs.	PPV in/s	Lowest expected Frequency (Hz)	Elastic Displacement (in.)
250	61.68	0.63	40	0.002509064
300	61.68	0.47	40	0.001874225
350	61.68	0.37	40	0.001464559
400	61.68	0.30	40	0.001182823
450	61.68	0.25	40	0.000979661
500	61.68	0.21	40	0.000827683
550	61.68	0.18	40	0.000710617
600	61.68	0.16	40	0.000618264
650	61.68	0.14	40	0.000543944
700	61.68	0.12	40	0.000483124
750	61.68	0.11	40	0.000432631
800	61.68	0.10	40	0.000390186
850	61.68	0.09	40	0.000354116
900	61.68	0.08	40	0.000323168
950	61.68	0.07	40	0.000296386
1000	61.68	0.07	40	0.000273033
1050	61.68	0.06	40	0.00025253
1100	61.68	0.06	40	0.000234416
1150	61.68	0.05	40	0.000218323
1200	61.68	0.05	40	0.000203951

Approximate closest distance to the Nyanza Superfund site.

It is important to note that the above timing, spacing and explosive's types are proposed based on previous experience. Changing geologic conditions, groundwater levels and site changes may warrant modifications in any or all of the parameters related to the blasting in order to maintain public safety.

As mentioned in the Test Blasting Procedures, relief is tantamount in ensuring safe blasting. Relief is the area which allows the expanding fragmented rock to safely move allowing for a high degree of control in designing and directing the results of a blast.

To advance and capitalize on the safety provided by the above conditions Blastech Corp. is confident that by limiting shot size that blasting can safely be conducted without producing excessive vibration or airblast and eliminating the opportunity for fly rock.

We appreciate having the opportunity to assist in this project and request that if you have any questions or concerns regarding this document you contact us at once.

Respectfully,

Michael J. Turner
Senior Blast Consultant

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Attachments:Exhibit-1, Exhibit-2 and Seis-1

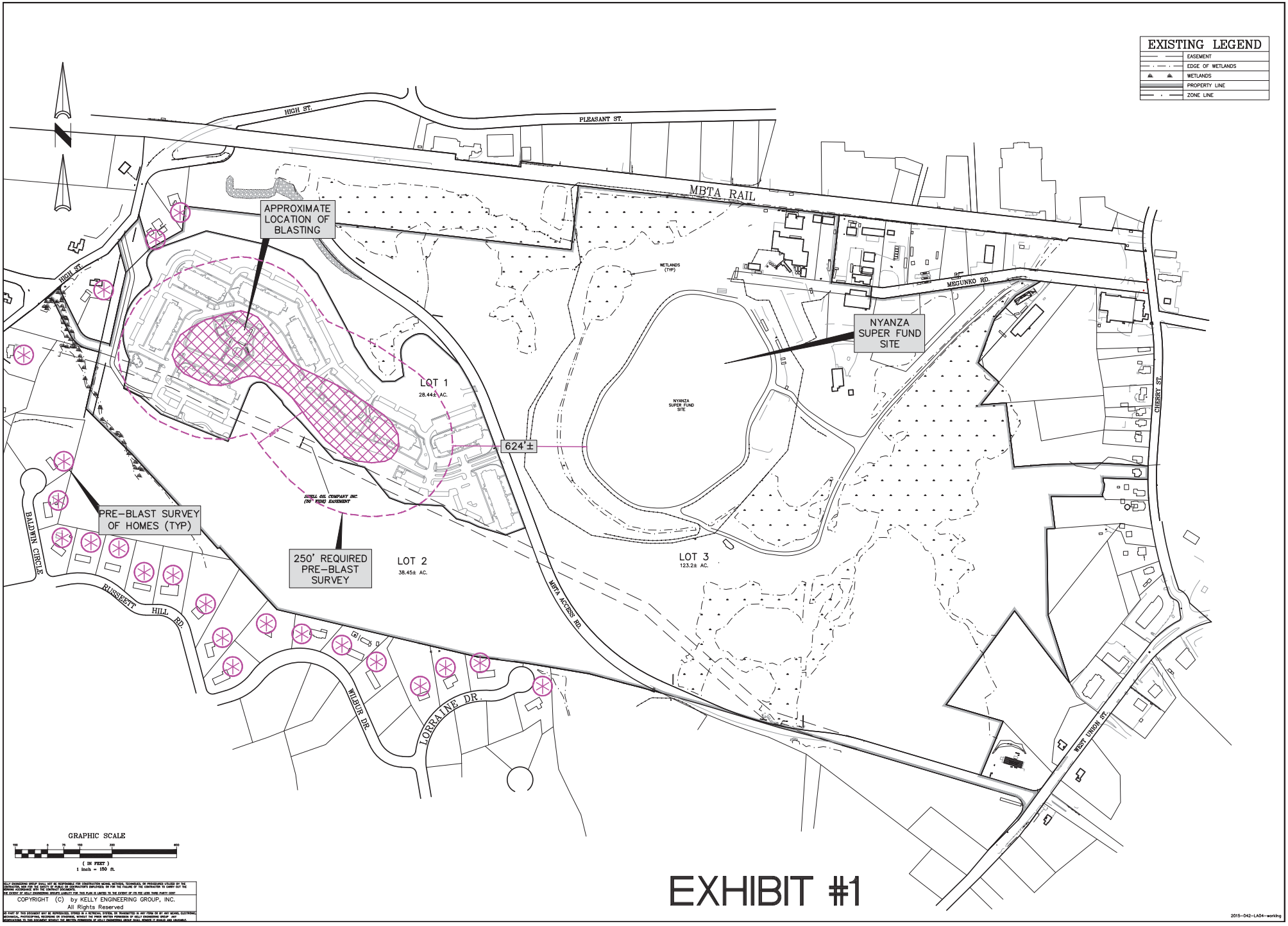
EXISTING LEGEND
EASEMENT
EDGE OF WETLANDS
WETLANDS
PROPERTY LINE
ZONE LINE
HIGH ST.
PLEASANT ST.
MBTA RAIL
APPROXIMATE LOCATION OF BLASTING
WETLANDS (TYP)
MEGUNKO RD.
NYANZA SUPER FUND SITE
LOT 1
28.44± AC.
NYANZA SUPER FUND SITE
624'±
CHERRY ST.
SUNOCO OIL COMPANY INC. (50' WIDE) EASEMENT
PRE-BLAST SURVEY OF HOMES (TYP)
250' REQUIRED PRE-BLAST SURVEY
LOT 2
38.45± AC.
LOT 3
123.2± AC.
BALDWIN CIRCLE
RUSSEETT HILL RD.
MBTA ACCESS RD.
WILBUR DR.
LORRAINE DR.
WEST UNION ST.
GRAPHIC SCALE
(IN FEET)
1 inch = 150 ft.
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EXHIBIT #1
2015-042-LA04--working


EXISTING LEGEND
EASEMENT
EDGE OF WETLANDS
WETLANDS
PROPERTY LINE
ZONE LINE
HIGH ST.
PLEASANT ST.
MBTA RAIL
APPROXIMATE LOCATION OF BLASTING
WETLANDS (TYP)
MEGUNKO RD.
NYANZA SUPER FUND SITE
LOT 1
28.44± AC.
NYANZA SUPER FUND SITE
CHERRY ST.
624'±
SUNOCO OIL COMPANY INC. (50' WIDE) EASEMENT
250' REQUIRED PRE-BLAST SURVEY
PROPOSED SEISMIC MONITORING LOCATION (TYP)
LOT 2
38.45± AC.
LOT 3
123.2± AC.
BALDWIN CIRCLE
RUSSETT HILL RD
MBTA ACCESS RD.
WILBUR DR.
LORRAINE DR.
WEST UNION ST.
GRAPHIC SCALE
(IN FEET)
1 inch = 150 ft.
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EXHIBIT #2
2015-042-LA04--working

Event Report

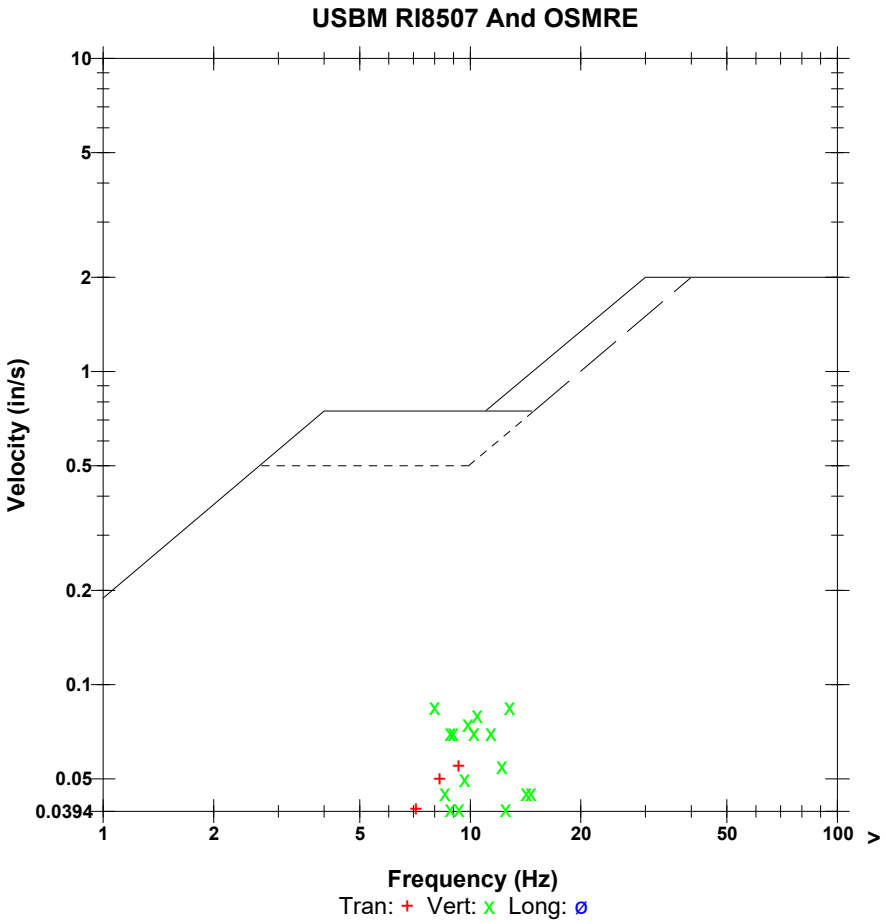
Date/Time	Vert at 11:06:04 March 24, 2014
Trigger Source	Geo: 0.050 in/s
Range	Geo: 10.000 in/s
Record Time	1.0 sec at 1024 sps

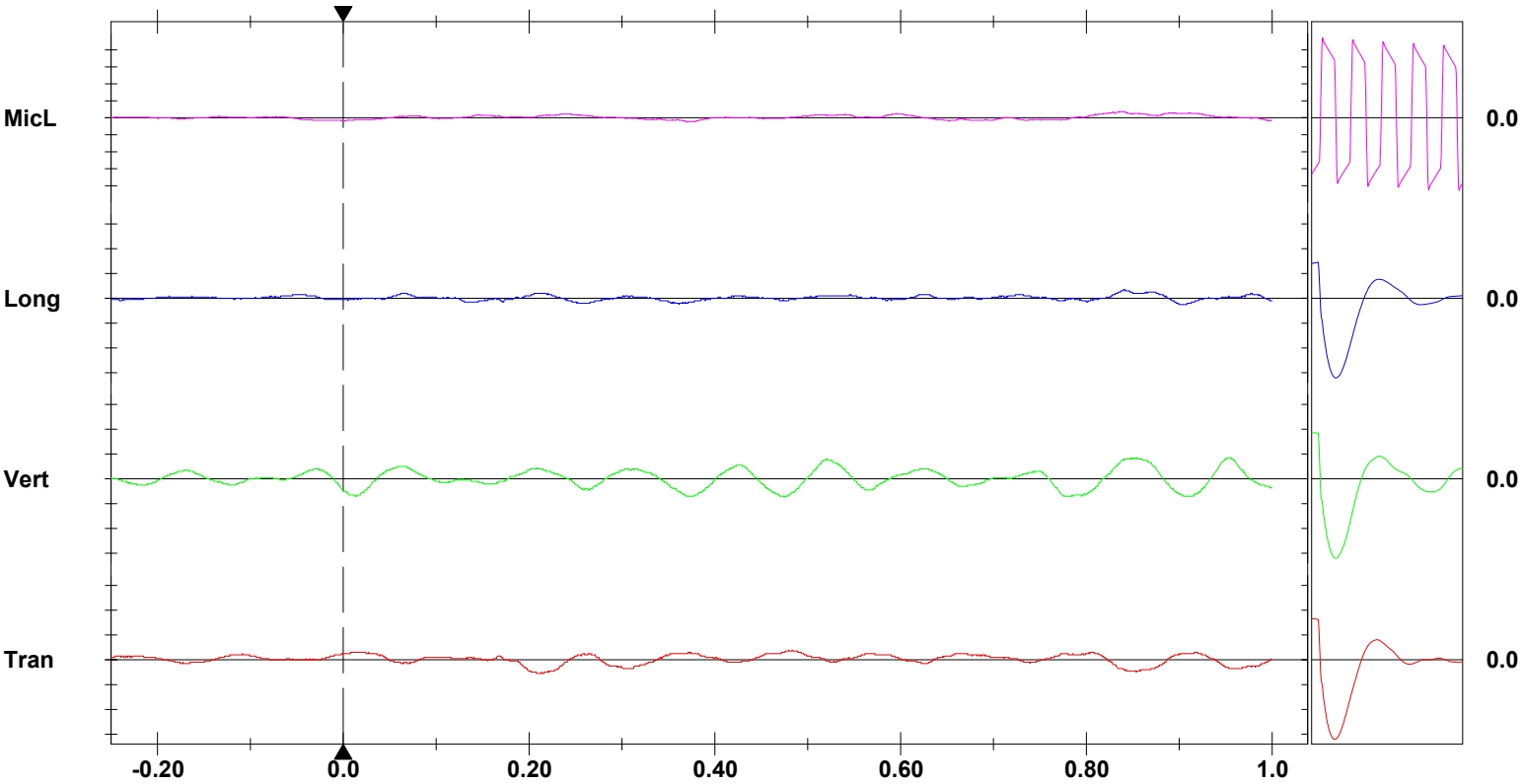
Serial Number	BE9937 V 10.31-1.1 Minimate Blaster
Battery Level	6.3 Volts
Unit Calibration	May 1, 2012 by Instantel
File Name	K937F93I.U40

Notes

Microphone	Linear Weighting
PSPL	0.000 psi(L) at 0.835 sec
ZC Freq	3.4 Hz
Channel Test	Passed (Freq = 20.5 Hz Amp = 577 mv)

	Tran	Vert	Long	
PPV	0.055	0.085	0.035	in/s
ZC Freq	9.3	8.0	8.4	Hz
Time (Rel. to Trig)	0.208	0.848	0.840	sec
Peak Acceleration	0.013	0.027	0.027	g
Peak Displacement	0.001	0.002	0.001	in
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.0	Hz
Overswing Ratio	4.0	3.5	4.2	





Time Scale: 0.10 sec/div **Amplitude Scale:** Geo: 0.100 in/s/div Mic: 0.001 psi(L)/div
Trigger =

SEIS-1